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POLYESTER STAPLE FOR WET TYPE NON-WOVEN FABRIC HAVING LATENT CRIMPING DEVELOPMENT AND ITS PRODUCTION

[潜在捲縮発現性を有する湿式不織布用ポリエステル短維とその製造方法]

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(54) [Title of the Invention] **POLYESTER STAPLE FOR WET TYPE NON-WOVEN FABRIC HAVING LATENT CRIMPING DEVELOPMENT AND ITS PRODUCTION**

(57) [Abstract]
[Problem] To provide a polyester staple for wet type non-woven fabric having latent crimping development which has low weight and good manufacturability.
[Solution] A polyester staple for wet type non-woven fabric which has as its principle component the polyester polypropylene terephthalate as the main component, and the polyester B is a side-by-side or an eccentric core sheath fiber whose principal component is polyethylene terephthalate, with the weight ratio of the polyester A and the polyester B as 30:70 ~ 70: 30.

[Claims]
[Claim 1] A polyester staple for wet type non-woven fabric having latent crimping development which has as its principle component a polyester A as the polypropylene terephthalate as the main component, and the polyester B is a side-by-side or an eccentric core sheath fiber whose principal component is polyethylene terephthalate, with the weight ratio of the polyester A and the polyester B as 30:70 ~ 70: 30.

[Claim 2] A polyester staple for wet type non-woven fabric having latent crimping development as in Claim 1 with a cut length of 2~100mm, whose fineness is 0.5 ~ 6 deniers.
[Claim 3] A polyester staple for wet type non-woven fabric having latent crimping development as in Claim 1 or Claim 2 which satisfies the following conditions (1) and (2).
μ (W) <= 0.2 (1)
μ (W)/μ (D) <= 0.7 (2)
μ (W) : Coefficient of friction between fibers when humid
μ (D): Coefficient of friction between fibers when desiccated
[Claim 4] A manufacturing method of a polyester staple for wet type non-woven fabric having latent crimping development wherein its principle component is a polyester A as the polypropylene terephthalate as the main component, and the polyester B is a side-by-side or an eccentric core sheath fiber whose principal component is polyethylene terephthalate, and there is fusion at a high temperature of 10~30 °C compared to the melting point of every component that results in a weight ratio of the polyester A and the polyester B as 30:70 ~ 70: 30, and, b y compound spinning to a side-by-side type or eccentric sheath core type, and after carrying out stress heat treatment at a processing temperature of 100 ~190 °C during extension processing, and by adding oil, a cut is made of cut length 2~100 mm.

[Detailed Explanation of the Invention]
[0001]
[Technical Field of the Invention] This invention is related to polyester staple for wet type non-woven fabric having latent crimping development which is superior in non-woven processing speed and which is appropriate for the manufacture of light weight and good elastic polyester non-woven fabric and its manufacturing method.
[0002]
[Prior Art] In the prior art, polyester compound short fibers which manifest crimps that are used as elastic non-woven fabrics are well-known, and are used as construction material of every kind of [UNKNOWN] beginning as cataplasm with the necessary elasticity.
[0003] However, for polyester fibers which potentially can display crimping, in the desiccation non-woven manufacturing line, crimping (elastic crimping) easily appears from the reactive force of the fibers originating in the axial direction, and when the fibers aggregate, uniform filamentation on the cylinder of the card filamentator which is a process which is generally performed is obstructed, and when scrapping off the filament web using a fly comb, the texture of the card web worsens, only non-woven material which has degraded in quality results. In addition, because of the fiber damage from the card or needle punch, elastic non-woven fibers which display fiber characteristics do not necessarily result, and should the conditions of manufacture be those described, there is the problem of reduced manufacturability. Furthermore, with non-woven fabric, because there is a decrease in the polymer's self elastic recover rate, it is possible to obtain only a slight elongation recovery rate for non-woven fabric.

[0004]
[Problems that the Invention is to Solve] This invention eliminates the failures relating to prior art elastic non-woven fabric, does not degrade the non-woven fabric manufacturing line speed, and for non-woven fabric, provides a polyester short fiber used for wettable non-woven fabric which has the potential for crimping that is appropriate for the manufacture of elastic non-woven fabric which has high elongation recoverability.
[0005]
[Means of Solving the Problems] A polyester staple for wet type non-woven fabric having latent crimping development which has as its principle component a polyester A as the polypropylene terephthalate as the main component, and the polyester B is a side-by-side or an eccentric core sheath fiber whose principal component is polyethylene terephthalate, with the weight ratio of the polyester A and the polyester B as 30:70 ~ 70: 30, and a polyester staple for wet type non-woven fabric having latent crimping development with a cut length of 2~100mm, whose fineness is 0.5 ~ 6 deniers, and a polyester staple for wet type non-woven fabric having latent crimping development which satisfies the following conditions (1) and (2).
μ (W) <= 0.2 (1)
μ (W)/μ (D) <= 0.7 (2)
μ (W) : Coefficient of friction between fibers when humid
μ (D): Coefficient of friction between fibers when desiccated
and a manufacturing method of a polyester staple for wet type non-woven fabric having latent crimping development wherein its principle component is a polyester A as the polypropylene terephthalate as the main component, and the polyester B is a side-by-side or an eccentric core sheath fiber whose principal component is polyethylene terephthalate, and there is fusion at a high temperature of 10~30 °C compared to the melting point of every component that results in a weight ratio of the polyester A and the polyester B as 30:70 ~ 70: 30, and, b y compound spinning to a side-by-side type or eccentric sheath core type, and after carrying out stress heat treatment at a processing temperature of 100 ~190 °C during extension processing, and by adding oil, a cut is made of cut length 2~100 mm.
[0006]
[Implementation Mode of the Invention] The polypropylene terephthalate, whose main component is the main component of the polyester A which is used in this invention, is a dicarboxylic acid component principally with terephthalic acid, is a polyester with a glycol component comprising principally of trimethylene glycol, and as a substance that is made of repreating trimethylene terephthalate, and is a copolymer of dicarboxylic acid of glycol types such as ethylene glycol and butanedio or isophthalic acid and 2, 6 naphthalane carboxylic acid, all substances whose values lie in a range such that important characteristics of the polyesters are not damaged. From the relationships of the mechanical characteristics, the intrinsic viscosity is more than or equal to 0.5, desirably more than 0.7.

[0007] Polyethylene terephthalate, which is the main component of the polyester B which is used in this invention, with terephthalic acid as the main dicarboxylic acid component, is a polyester whose main glycol component isethylene glycol, and whose main repeating units are ethylene terephthalate units, and can be also a copolymer of for example dicarboxylic acid of glycol type such as butanediol or isophthalic acid or 2,6-napthalene dicarboxylic acid, with all substance amounts in the range such that the balance with the polyester A for heat shrinkage and rate of elastic recovery is not destroyed.

[0008] The compound ratio of the polyester A and polyester B in this invention, for the side-by-side type is in a range which does not destroyed this invention's effectiveness by being centered at 50:50, but can be changed, with 30:70~70:30 as desirable and 40:60~60:40 as good. In addition, even with an eccentric sheath core, the compound ratio of the polyester A and polyester B in this invention does not destroyed this invention's effectiveness by being centered at 50:50, but can be changed, with 30:70~70:30 as desirable and 40:60~60:40 as good.

[0009] As for the cut length of the polyester short fibers of this invention, when considering the dispersion or strength of non-woven fabric in water, 2 ~ 100mm is desirable, and 5~20mm more desirable. In addition, for the fineness, from the aesthetic point of view of the paper-like non-woven fabric, 0.5 ~ 6.0 deniers is desirable. If narrower than 0.5 deniers, when stirring the fibers dispersion, aggregation easy occurs, and in addition, when thicker than 6 deniers, it is difficult to obtain aesthetic, soft paper like non-woven fabric.

[0010] For the friction coefficients between fibers in this invention, with μ (W) > 0, the dispersion in water of the polyester fibers becomes worse, and it becomes necessary, when paper making, to add agents such as dispersants or gum and the like, and moreover, in addition, there cannot be obtained uniform quality paper-like non-woven fabric. In addition, when μ (W)/μ (D) > 0.7, there are instances of cotton flies during the manufacturing process of the polyester short fibers, and it is easy for various problems during the manufacturing process to arise.

[0011] As a surface processing agent of the polyester fibers of this invention, it is possible to cite polyalkylene glycol or its derivatives. It is desirable that the polyalkylene glycol be polyethylene oxide, polypropylene oxide, poly TETOTA [UNKNOWN] methylene oxide, and in addition, it is possible to form a substance which comprises an arbitrary combination of these compounds. The above-mentioned derivatives are substances derived through condensed polymerization of the acidic components at the ends of these substances, and the acid components can be a terephthalic-acid component, an isophthalic acid component, a benzenesulfonic acid alkali-metal salt component, a higher-fatty-acid component, or a monocarboxylic acid component.

[0012] Furthermore, average molecular weights are in the range of 50,000 ~ 1, 500,000

and more desirably in the range of 100,000 ~ 1,000,000. When the average molecular weight is less than 50,000, the coefficient of friction between the fibers when humid is large, and dispersion in water of the polyester fibers becomes worse. In addition, when the molecular weight exceeds 1,500,000, the processing agent's self-viscosity becomes high, and difficulties easily occur such as machine contamination during the processing which is imparted to the polyester fibers and also roll coiling.

[0013] In addition, the adhesion amount for the polyester fiber of the above-mentioned processing agent is desirably in the range of 1~2 wt. %, and more desirably in the range of 0.2 ~ 1.0%. When the attachment efficiency is low compared to 0.1 wt. %, the dispersion in water of the polyester fibers becomes worse, and if higher than 2 wt. %, is not as good as described above, and only wastes the processing agent, creating such problems as contamination during the process which imparts to the polyester fibers and the operation of roll coiling.

[0014] The fiber's cross-sectional surface, as a variational or hollow cross-section, when there is aggregation, and with mechanisms which result in moisture migration by the phenomenon of bulk, texture, and capillary, is desirable. In addition, in order to impart static control, fire resistance, an antibacterial deodorized ability, and a smooth texture, there can be arbitrary blending, within a range which does not damage this invention's goal effectiveness, of surface agents, additives and a 3rd component.

[0015] By a well-known polyester 2 component spinning device, the polyester fibers used in paper which have the possible crimping of this invention, by melting at a temperature 10~30 °C higher that the melting point, are made into a compound by linking directly in front of the orifice. The intrinsic viscosity of the polyester A whose principal component is polypropylene terephthalate and polyester B whose principal component is polyethylene terephthalate are desirably set so that the melt viscosity difference, when melting at the same temperature of 10~30 °C higher than melting from the polymer discharge stability from the spinning nozzle when melting while spinning, is 500 poise or less. In addition, cooling of the melted spinning thread may be performed by the method of uniform cooling or unsymmetrical cooling in a range which does not disturb this invention's effectiveness. After cooling, there is a 2- or 3-stage elongation for the non-extended yarn which was obtained in this way. At stage 1, there was performed, at a tow temperature of 50~100 °C, an elongation using 70 ~ 0.75 times the fracture draw magnification (MDR), and at the 2-stage, an MDR of 800 ~0.85 times was performed. In addition, when necessary for the application, there was a 3-stage with MDR of 9~ 0.95 times. After the processes of extension and oil impartation, the specified cut length (5 ~ 100mm) was manufactured by cutting, and it is necessary after the 2-stage or 3-stange to perform a street heat treatment at a heat treatment temperature of 100~190 °C. The polyester short fibers of this invention which are used for wettable non-woven fabric which have potential crimping by combining the polyester A whose principal component is polypropylene terephthalate and the polyester B whose principal component is polyethylene terephthalate, when crimping manifests itself frequently, and heat processing can not be performed by tension at the time of extension, and when performing tension and heat treatment at a temperature of more than 100 °C, and when

the degree of crimping of possible crimp which manifests itself when heat processing, is excessive for non-woven fabric, degradation in the extensibility results for non-woven fabric and there is entanglement among the desired fibers. In addition, when performing tension and heat processing at a temperature equal to or more than 190 °C, wettable crimping is reduced, and fiber aggregation results with degradation in expanding recoverability.

[0016]
[Working Example] Below is shown a working example. The measuring methods with physical property values in the working example and in this paper are as follows.
(1) Limiting viscosity
Use a parachlorophenol solvent, and normally measure at 25 °C
(2) Fineness
Measurement by JIS-1015-7-5 method
(3) Friction coefficient between fibers at the time when desiccating and when humid
Harvest under tow conditions directly before cut, and the frictional coefficient between the fibers at the time of desiccation measures when the polyester fibers are desiccated at 100 °C is assumed to be the frictional coefficient between the fibers when humid is when measured in water without desiccation. The measurement method of the frictional coefficient between the fibers is performed by the Roder Method of JIS-L1015, and when humid, the fiber portion that is to be measured is adjusted so as to be immersed in water. Moreover, the peripheral speed of the cylinder at measurement time is assumed to be 2cm/ sec.
(4) Dispersion Evaluation Method
In a beaker of 200cc, enter 50cc of distilled water and 25g of the polyester fiber (actual weight), and stir for 5 minutes by magnetic stirrer. Afterwards, move to a 1000 cc measuring cylinder, and dilute to 500 cc using distilled water, and disperse the fibers by rotating once in the up and down directions the measuring cylinder, and along with counting the number of solid fibers which are contained within, determine whether there is dispersion from the expanded conditions of the fibers within the water.
©: Very good O: Good Δ: Intermediate X: Poor
(5) Creation Method for Wettable Non-woven Fabric
First, after dispersing the short fibers in the water so that the slurry concentration becomes 0.15%, after draining the water, put on a sheet. Afterwards, using a water punch, after confounding the fiber, heat treat for 60 seconds at 160 °C, forming an elastic non-woven fabric of texture of $30g/m^2$ and thickness 0.3mm.
(6) Texture
Cut the trial fragment into 20cm x 20 cm, let stand for 24 hours or more under standard conditions (temperature 20 ± 2 °C and relative humidity 65 ± 2%), weigh using a weight scale, and show the texture using mass (g/cm^2) per unit surface area (1 cm^2).
(7) Thickness
Measure the thickness of the sample at 5 arbitrary points using an OZAKI DIAL GAUGE and assume the average value.

(8) 50% Expansion Recovery Rate

Assuming a 50mm x 200mm trial fragment as the held cloth in a tension test machine of constant extension speed which has an automatic recording device, there is fitted for 100mm in the line direction of the paper shaped non-woven fabric, and tensing for 50mm using a tension speed of 500mm/ min, and is returned to the original position using the same speed, and after extending for 50mm there is drawn a load-extension curve, and using the extension (a) at the return point, there is shown the 50% expansion recovery rate by the following formula.

50% expansion recovery rate = ((50 – a)/50) x 100

[0017] Working Examples and Comparative Examples

Using a compound spinning device of for the polyester A, the intrinsic viscosity = 0.83 of the polypropylene terephthalate 100%, and for the polyester B, the intrinsic viscosity = 0.63 of the polyethylene terephthalate 100%, using the compound ratio and fiber cross-section surface which is shown in Table 1 with a nozzle cap opening of 285 °C from the round cross-section metal cap opening, and by wrapping at an uniforate discharge amount of 1.07g/ minute, and 1900 m/min, obtaining the unextended yarn. Perform the 1st stage extension by extending at MDR 0.75 times in a hot bath of 75 °C these unextended threads, and perform a 2nd stage extension at an MDR of 0.80 times under humid and hot conditions of 100 °C using steam, and afterwards, perform stress heat processing at 160 °C, attaching the surface processing agent that is indicated in Table 2, and cut a fiber 10mm long using an Eastman cutter, obtaining the short fibers of this invention of fineness 2.5 deniers. Afterwards, by the above-mentioned method, form a wet non-woven fabric. Shown in Table 1 are the effects of the compound factor and the compound forms of the fibers, and shown in Table 2 are the effects of the fiber surface processing agents and attachment factors.

[0018]

[Table 1]

	Compound Form	Compound Ratio A:B	Non-woven extension recovery rate
Working Example-1	S/S	50:50	76
Working Example-2	S/S	40:60	73
Working Example-3	S/S	30:70	70
Working Example-4	S/S	70:30	72
Comparative Example -1	S/S	20:80	59
Comparative Example -5	S/C	50:50	65

[0019]
[Table 2]

	Surface Processing Agent	Coefficient of friction between fibers			Number of solid fibers	Dispersion Conditions
		Desiccation	Wet	Wet/dry ratio	0	O
WE-6	Polyethylene oxide	0.40	0.19	0.41	0	@
WE-7	Polyethylene oxide	0.35	0.16	0.46	0	@
WE-8	Polyethylene oxide	0.33	0.17	0.52	0	@
WE-9	Polyethylene oxide	0.33	0.15	0.45	0	@
WE-10	Polyethylene oxide	0.30	0.14	0.47	0	@
WE-11	Polyethylene oxide	0.32	0.15	0.47	0	@
WE-12	Polyethylene oxide	0.30	0.15	0.50	0	@
WE-13	Polyethylene oxide	0.26	0.18	0.69	0	@
CE-2	Polyethylene oxide	0.32	0.23	0.72	2	Δ
CE-3	Polyethylene oxide	0.32	0.25	0.78	3	Δ
CE-4	Lauryl phosphate K salt	0.24	0.20	0.83	5	Δ
CE-5	Lauryl phosphate K salt	0.24	0.19	0.79	7	X
CE-6	POE alkyl ether	0.21	0.16	0.76	4	Δ

[0020]
[Effect of the Invention] The fiber manufactured by this method has excellent for the paper-making process, and can offer elastic non-woven fabric which had excellent low texture and had expansion recoverability from potential crimp after heat treatment.